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(54) [Title] MAGENTIC RECORDING AND PLAYBACK DEVICE

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(56) Cited Reference: Takashi Ohka, 1 other, ed., "Data Recorders and Applications Thereof", July 25, 1973, Published by Ohmsha, pp. 148-151

Claim

A magnetic recording and playback device characterized in that during recording, a CTL pulse is pulse-width modulated with a time code signal, that represents the tape position of a magnetic tape while running as an absolute address, and is recorded on a CTL track of a magnetic type; and during playback, the aforementioned time code signal is separated from the playback signal reproduced from the CTL track, and the absolution position of the magnetic tape during playback is sensed.

Detailed explanation of the design

The present design relates to a magnetic recording and playback device that records a control pulse (CTL pulse) that has been pulse-width modulated with a time record signal, that represents the time information during recording in a tape recorder with an absolute value, on a control track (CTL track), and that can sense the time information on the video tape from the recording start point during playback.

The major feature of a video tape recorder is that deletion, recording and playback can be repeated any number of times. Then, assembling several sources that are not limited in terms of time or location into one program (editing) is easy. With a video tape, unlike film, however, it is not possible to view the images themselves as individual frames, and to edit the aforementioned one program by accurately determining joins, absolute time information from the recording start point on the aforementioned video tape will be necessary.

In answer to this, counting the CTL pulses, in which the vertical synchronization signal frequency has been divided by 1/2, for example, that are recorded on the control track of the aforementioned video tape, reproducing the audio cue signal corresponding to the position, sensing this, and obtaining the aforementioned position information (cue tone system) is conceivable, but it is not possible to read the time from the point recording was initially started, that is, the absolution position for the recording start section on the magnetic tape (referred to as absolute address hereafter), with these. Indicating the run time (or position) of the video tape with a mechanical counter associated with the pinch rollers or reels is also conceivable, but because slip, etc. is produced between the rubber belts or pulleys linked to said counter, error is easily produced, and accurate position reading is impossible. For this reason, converting the aforementioned absolute address to a pulse and recording it on a separate track, called the SMPTE code system, has been proposed, but because it requires a separate track, when a magnetic tape with a set tape length is used, a means to make the tracks narrower for video signals, for example, is required, and various problems occur.

The present design proposes a new recording and playback system with which absolute position information obtained with the aforementioned SMPTE code system is programmed based on the aforementioned CTL pulses, and the aforementioned absolute address will be recorded without forming a separate track.

Generally, with a two-head standard type video tape recorder, 30 pulse/second CTL pulses are recorded on a control track (CTL track) during recording, and the tape moving system is servo-controlled with playback signals, that is, CTL pulses, from the aforementioned CTL track. So, with the present design, CTL pulses that have been pulse-width modulated with a time code signal that represents an absolute address on the magnetic tape are recorded on the CTL track of the magnetic tape, and the absolute address on the magnetic tape is sensed by separating the aforementioned time code signal from the playback signal from the aforementioned CTL track during playback. Information that represents the aforementioned time code signal, that is, an absolute address on the magnetic tape, can be given as a time code as shown in Figure 1 by modulating the back edge of said CTL pulse, if the front edge of the CTL pulse, for example, is used for servo control of the tape moving system. That is, when the duty cycle of the aforementioned CTL pulse is changed by pulse-width modulation, an 18-bit pulse is formed as

time information and the remaining 12 bits are used as a reset signal for synchronization, a time chart in which this is coded will be as shown in Figure 1. Here, first, those with a large pulse width are considered as having time information, those with a small pulse width are considered as having no time information, and the two types — with and without information — are digitally coded for hours, minutes and seconds. That is, in Figure 1, among the aforementioned 30-bit pulses given in 1 sec, the first 2 bits represent time information for 20 h, the next 2 bits represent time information for a maximum of 3 h, the next 3 bits represent time information for 30 min, and the next 4 bits represent time information for 5 min. The following 3 bits represent time information for 1 second, and the next 4 bits additionally represent time information for 3 seconds. Note that the pulses between the time information are synchronizing pulses, and the time for a CTL pulse is regulated. The final 7-bit pulse is a reset pulse, reset is applied in frame units, and integration of error is eliminated.

Note that the way of thinking as with and without time information according to the pulse width magnitude is arbitrary, and those with a small width could also be considered as the ones having it.

In addition, as for the aforementioned time information of 1 sec or less, the aforementioned CTL pulses can be counted and information for even 1/30 sec can be obtained. That is, it can be seen that it is possible to detect and indicate absolute time with a precision of 1/30 sec for 1 frame. Note that with the aforementioned SMPTE code system, recording is at a ratio of 80 bits/frame, for a dedicated code track, so the sensing means will be complicated. With the aforementioned recording system, though, the track for the CTL pulses serves double duty, and 30 bits/ second can, furthermore, be sensed with a precision of 1/30 sec, so the practical value is high. In addition, with the counter for indicating time of 1 sec or less, the frame unit can be set every second with the aforementioned reset pulse, and therefore, error is not integrated.

Figure 2 shows the recording circuit of the present design with a block diagram. 1 is a digital timer, for example, and the digital output is applied to an encoder 2, and from there it is coded and a pulse is output. The coded pulse is synchronized to a clock signal from a vertical synchronization signal generating circuit 3 to prevent time axis fluctuation. The signal that is synchronized in this way is applied to a mono multivibrator 4. There, a prescribed modulation is applied for each frequency, where the aforementioned clock frequency has been divided by 1/2 in a frequency divider circuit 5, and time coded pulses as shown in Figure 1 are obtained. Next, the pulses are recorded on the control track with a known CTL head 7 through a recording amp 6.

Next, Figure3 shows the playback circuit of the present design with a block diagram. During playback, aforementioned CTL head 7 reproduces the signal corresponding to the time coded pulse on the aforementioned control track and a shaped pulse is obtained from a pulse shaping circuit 9 through a playback amp 8. With the shaped pulse, the duty cycle between

playback pulses is sensed in a duty cycle sensing circuit 10, pulse width outputs with different time information are obtained corresponding to each of the sensed duty cycles, they are converted to time information (or position information) by a decoder 11, and are displayed with a display device 12. This display, as shown in aforementioned Figure 1, represents units of hours, minutes and seconds. In addition, the output of aforementioned decoder 11 includes a 7-bit set signal (SYNCOWRD) in 1 sec, and a counter 13 connected to the output side of aforementioned amp 8 is reset. Counter 13 counts the vertical synchronization signals, they are converted to 1/30 sec CTL pulses by a decoder 14, and those are counted. Display is provided with a display device 15 down to units of 1/30 sec. Therefore, the absolute address for magnetic tape running can be read at units of 1/30 sec with a relatively small 30 bits. It is also possible for conventional CTL pulses to serve double duty unchanged, while counter 13 is also reset with a synchronization pulse (SYNC·WORD) in each frame, and therefore there is no risk of error being integrated.

As is clear from the above explanation of this application example, with the present design, pulse-width modulation is carried out with a time code signal that represents the tape position of the magnetic tape while running, and this is recorded on the CTL track of the magnetic tape during recording. The aforementioned time code signal is separated from the playback signal reproduced from the CTL track during playback, and thus the CTL head and CTL track are effectively utilized, without a separate head and separate track specifically for recording and playback of the time code signal being provided, the magnetic tape position can be sensed with an absolute address during playback, and the anticipated objective can be sufficiently achieved.

Brief description of the figures

Figure 1 is a time chart of pulses that are time coded with the present design. Figure 2 is a block diagram of the recording circuit for the same coded pulses. Figure 3 is a block diagram of the playback circuit for the same.

1 … digital time, 2 … coded pulse forming circuit, 3, 5 … CTL pulse forming circuit, 7 … CTL head, 10 … duty cycle sensing circuit, 13 … counter.

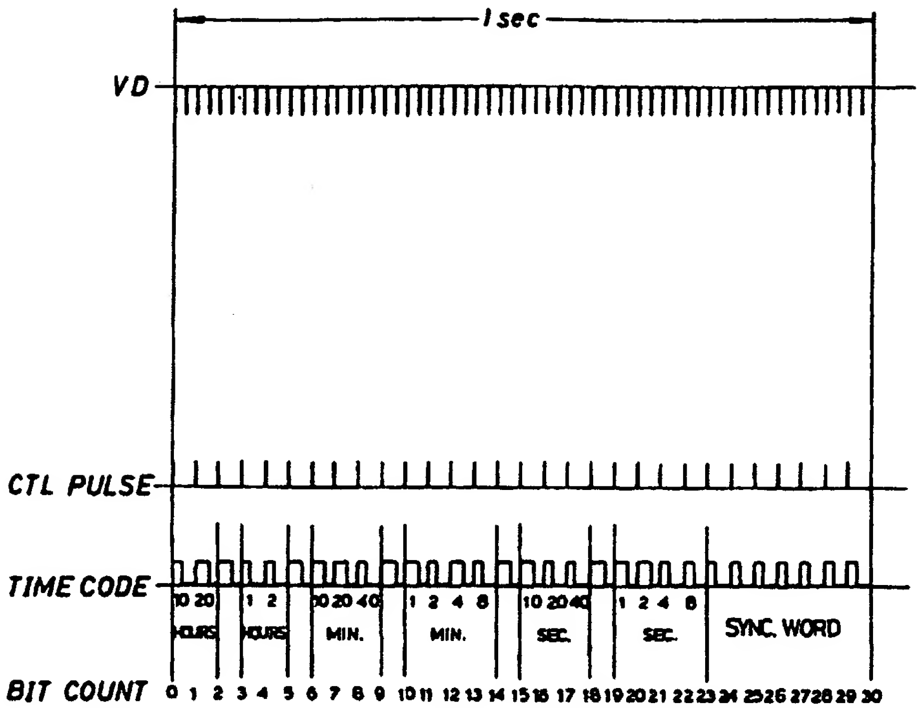

Figure 1

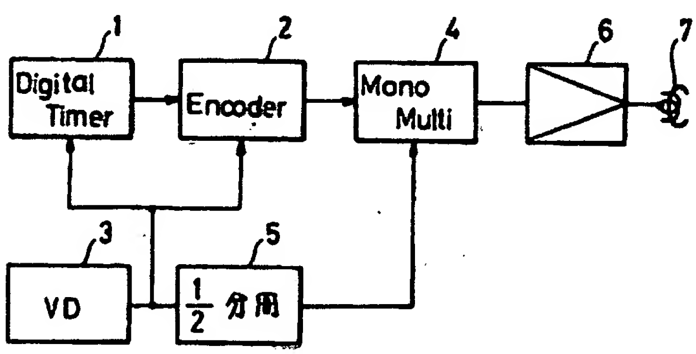

Figure 2

Key: 5 1/2 frequency division

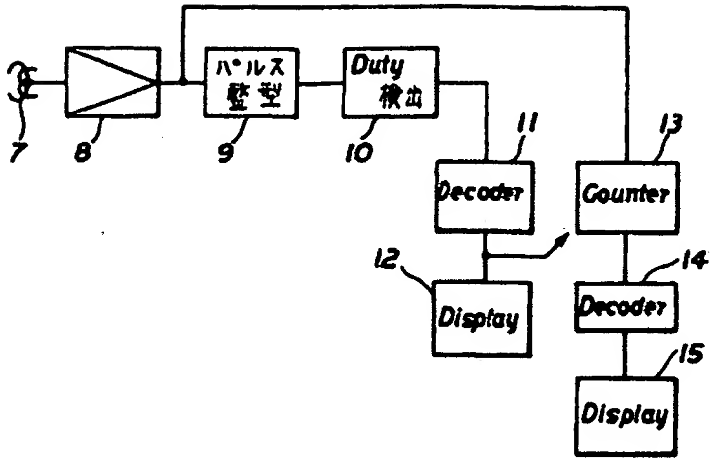

Figure 3

Key: 9 Pulse shaping
10 Duty cycle sensing